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Using Tailor Made Composite Specimens.

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Principal Investigator: Vincent K. Choo

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Office of Grants and Contracts
Box 30001/Department 3699
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Report

The main objective of this research was to make significant contributions to the development of the acoustic-ultrasonic NDE method. A particular area of research interest under this grant was the generation and transmission of ultrasonic waves by the acousto-ultrasonic NDE method in a thin composite plate. It was noted in open literature that symmetric and anti-symmetric Lamb waves were generated in thin composite plates by the acousto-ultrasonic NDE method. In this project, the research work was designed to investigate the effect of the presence of reinforcement fiber on the acousto-ultrasonic signals. To this end, fiber-bridging unidirectional laminated composite specimens were custom made and subsequently tested using the acousto-ultrasonic NDE method. The results indicated that the symmetric Lamb waves generated in a thin composite plate could propagate through the bridging fiber. However, anti-symmetric Lamb waves were filtered out by the bridging fiber [1]. No conclusive evidence could be gathered to demonstrate the separate generation and propagation of ultrasonic signals in the continuous fiber embedded within a composite plate. Nevertheless, this research work has provided an understanding on the generation and transmission of an acousto-ultrasonic signal in glass reinforcement fiber. It has subsequently led to the initiation of two research projects that try to exploit the acoustic characteristics of glass fiber.

The first of these two projects is on the in-situ cure monitoring of polymeric composites [2]. The other is on the in-situ monitoring of a previously cured composite plate subjected to a high temperature environment [3]. In both of these projects the acousto-ultrasonic NDE method is used in conjunction with glass fiber wave-guides. These two projects are currently underway.

Reference

- [1] Choo, V.K., Gomez, M., Khazaee, M., and Tapia, G.B., 'Characterization of the acousto-ultrasonic NDE method using tailor made composite specimens', Proceedings of the second international conference on acousto-ultrasonics, editor: A. Vary, ASNT, 1993
- [2] Choo, V.K. and Gomez, M., 'Acousto-ultrasonic NDE for in-situ cure monitoring of polymeric composites', Research report for LeRC, NASA, 1994
- [3] Choo, V.K., and Gomez, M., ' High temperatures acousto-ultrasonic NDE for composites', Research report for LeRC, NASA, 1994